Review 27 Parametric Equations

$x = f(t)$ $y = g(t)$

often give $\frac{dx}{dt}$, $\frac{dy}{dt}$ & initial conditions

solve for x & y {might use FTC dudes}

acceleration $\left(\frac{d^2x}{dt^2}, \frac{d^2y}{dt^2}\right)$

speed $= \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}$

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slope $= \frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$

total distance $\int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt$

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Ex 1 $\frac{dx}{dt} = \sqrt{3t}$ $\frac{dy}{dt} = 3\cos\left(\frac{t^2}{2}\right)$

The particle is at $(1,5)$ when $t=4$

a) Find $\hat{a}(4)$

b) Find $y(0)$

c) When does the speed first reach 3.5?

d) Find the distance traveled during the first 4 sec.

e) Find the equation of the tan line at $t=4$

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a) $\hat{a}(4) = \langle 0.433, -11.872 \rangle$

b) $5 + \int_4^0 3\cos\left(\frac{t^2}{2}\right) dt = 1.600$

c) $\sqrt{3t + 9\cos^2\left(\frac{t^2}{2}\right)} = 3.5 \quad t = 3.225$

d) $\int_0^4 \sqrt{3t + 9\cos^2\left(\frac{t^2}{2}\right)}\, dt = 13.182$

e) $m = \left.\frac{\frac{dy}{dt}}{\frac{dx}{dt}}\right|_{t=4} = -.126$

$y = -.126(x-1) + 5$

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